reluctance of parents to admit that their children do not attend school for the greater part of the year. In some instances it was perfectly obvious that the parents' statements were false.

It seems clear, then, that in regard to the employment of children the instructions to enumerators for the present census were materially different from the instructions for the two previous censuses, and that this difference must have resulted in greatly reducing the number of children reported as employed in gainful occupations.

H. L. BLISS.

CHICAGO.

THE MARGINAL THEORY OF DISTRIBUTION

In his recent article on " Marginal Units in the Theory of Distribution," Mr. J. A. Hobson raises a number of objections to the theory which attempts to explain the distribution of wealth on the basis of the marginal productivity of the various factors. His objections seem to the present writer to be due to a misconception of certain vital points in that theory. His argument seems to be, in brief, that if the marginal unit of labor — on a farm, for example — gets all it produces, there will be nothing left over for the employer, since all units are alike and will produce equal amounts. That is, if one laborer produces as much as another, and if each one gets what he produces, the laborers will get the whole product, and there will be nothing left for anyone else. Speaking of a farmer who employs a number of laborers and other factors, he says:

How are we to conceive the profits of our farmer? If there is no surplus in the employment of the last unit, and the last unit is just as productive as any other unit, it would appear that no profit could arise. The ordinary diagrammatic representation of the " dosing " theory does indeed show a surplus derived from the employment of each increment except the marginal one. The familiar figure on the following page runs thus:

Here AB represents the entrepreneur's personal power; to it are added ten increments of land-labor-capital, to which a diminishing amount of productivity is attached, the first unit yielding the figure $ABb^1 a^1$, the tenth yielding $a^9 b^9 DC$. The marginal increment alone receives in payment virtually its whole product; each of the others yields a surplus receiving the same payment as the last, but affording a larger product. Here the entrepreneur appears to make a large profit on all the earlier increments.

But this figure is a most fallacious one, if designed to explain how the aggregate product of the fully organized business is apportioned. For it

appears to show that the ten increments are unequally productive, or that they receive unequal amounts of assistance from the energy of the entrepreneur; and neither supposition is warranted. For when there are ten units of land-labor-capital employed by the entrepreneur, if a separate productivity be attributed to each, whether or not that productivity includes the assistance of the entrepreneur, it must be the same for each of the ten.
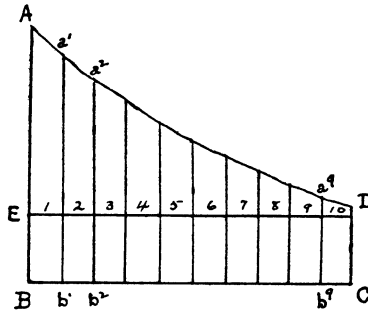
This remarkable argument is plainly based upon a failure to see the difference between the average product and the marginal product. Mr. Hobson's interpretation of the familiar diagram leaves no doubt upon this point, as will appear from a study of the following figure.

FIG. 1

In this figure it is assumed that a given farmer or business man can direct one unit of land-labor-capital so as to make it produce an amount represented by the rectangle $A\,a^1\,B\,b^1$, and that he could so direct two such units as to make them produce an amount represented by the rectangle $E\,a^2\,B\,b^2$. This shows a decline in productivity under a law which is quite analogous to the law of diminishing returns from land. That such a decline may be assumed to take place is admitted in the terms of Mr. Hobson's argument; otherwise there is no meaning in his descending curve $A\,a^1\,a^2\,a^9\,D$ (Fig. 1). But, it must be observed, Fig. 2 represents a decline both in the average productivity per unit of land-labor-capital and in the

FIG. 2

marginal productivity of these units. When the same manager directs one unit, the productivity was $A\,a^1\,B\,b^1$; but when he directs two units, the average productivity per unit falls to $E\,g\,B\,b^1$ or $g\,a^2\,b^1\,b^2$. If the broken line $A\,a^1\,g\,a^2$ were resolved into a descending curve, it would represent the decline in the average productivity.
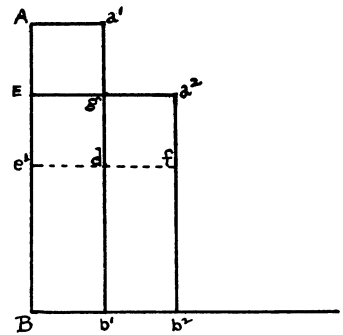
If this were the curve $A\,a^1\,a^2\,a^9\,D$ in Fig. 1, all that Mr. Hobson says would be quite true. If the second unit in Fig. 2 received as wages an amount equal to $g\,a^2\,b^1\,b^2$, and the first unit received an

equal amount, there would obviously be nothing left for the business man. But it must not be overlooked that with a decline in the average productivity per unit there is necessarily a *still more rapid* decline in the marginal productivity. The marginal productivity in this case is to be determined by finding how much the second unit *adds to the* product of the establishment. How much more do two units produce than one produced. This is obviously to be determined by subtracting rectangle $A a^1 B b^1$ from rectangle $E a^2 B b^2$, which will amount to the same thing as subtracting rectangle $A a^1 E g$ from $g a^2 b^1 b^2$. This leaves the rectangle $d f b^1 b^2$ as the amount *added* by the marginal laborer. In other words, $d f b^1 b^2$ is the marginal product of land-labor-capital. Then, if the employer pays this amount — its marginal product — to the second unit, and to the first unit the same amount, he will have something left over for himself, viz., $A a^1 e^1 d$, or $E a^2 e^1 d$.

From what has been said it follows that the curve representing the decline in the marginal productivity of successive units of land-labor-capital should be made from the broken line $A a^1 d f$. Then the total product would be represented by the irregular figure $A a^1 d f B b^2$, the marginal product by $d f b^1 b^2$, the total earnings of both units of land-labor-capital by the rectangle $e^1 f B b^2$, while the surplus remaining with the business man would be represented by the rectangle $A a^1 e^1 d$.

If Mr. Hobson's curve $A a^1 a^2 a^9 D$ in Fig. 1 had really represented the decline in the marginal productivity of successive units of land-labor-capital, all that he says in criticism of it would have been absolutely without meaning. Then the figure $a^9 D b^9 C$ would have represented the amount *added* to the product by the tenth unit, or, more accurately, the amount which ten units could produce over and above what nine could produce. This would then represent the value to the employer of any one of the ten units, and the total wages of the ten units would have been approximately ten times this amount, or the rectangle $E D B C$. But the total product would be represented by the irregular figure $A D B C$, leaving the employer in the possession of $A E D$.

In Fig. 3, which is only an elaboration of Fig. 2, the broken line $A a^1 g a^1 g^1 a^3 g^2 a^4$ would, if resolved into a curve, represent the decline in average productivity; while the broken line $A a^1 d f d^1 f^1 b^3 b^4$ would, if also resolved into a curve, represent the decline in marginal productivity. In this case the marginal productivity becomes *nil* when

four units are employed, which would be the real condition if four units could, when combined under a given manager, produce no more than three units could produce. Under such conditions a fourth unit would be worth nothing to the employer.
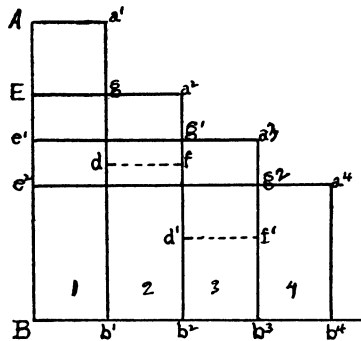

FIG. 3

There ought really to be no difficulty in distinguishing between the two curves, nor in seeing the necessity of confining attention to the curve representing the decline in marginal rather than average productivity. Unfortunately, Professor Clark has contributed, doubtless inadvertently, to the confusion on this point. In his *Distribution of Wealth* (p. 329, note) he uses the following illustration:

The upper boundary [of a curve previously explained] should have been the tops of the contiguous rectangles. With ten units of capital one man produces the amount that is expressed by the first rectangle in the following figure; while, after he has relinquished one-half of the capital to the second man, he produces only the amount indicated by the smaller rectangle on the right of the figure. The difference between these areas, or the space above the dotted line in the larger rectangle, expresses the product of five units of capital in the hands of one man.

Now, if the first man, with five units of capital, produces an amount indicated by the second rectangle, the second man with the other five units will produce an equal amount. The second rectangle then becomes the average rather than the marginal product. The total product would then be indicated by two rectangles like the second, rather than by the first plus the second. It would take a smaller rectangle than the second (smaller by the amount of the small rectangle above the dotted line in the first large rectangle) to indicate the marginal product of labor, or the amount

FIG. 4

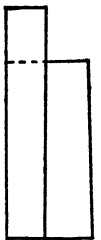by which the product of two men with ten units of capital exceeded that of one man with ten units.

This distinction between the decline in average productivity and the decline in marginal productivity can be made palpably clear by means of the following table, which purports to show how much could be produced with varying amounts of labor in one establishment, say

a farm, containing a given amount of land and a given equipment in the form of tools and working capital.

Number of Laborers	Total Product (Bushels)	Average No. of Bushels per Laborer	Marginal Product (Bushels)
1	500	500	...
2	900	450	400
3	1,200	400	300
4	1,400	350	200
5	1,500	300	100

The law of diminishing returns, as ordinarily interpreted, is shown in the third column; and if one were to base his theory of distribution upon this column alone, Mr. Hobson's contention would be sound. If, for example, the product of the fifth laborer were conceived to be 300 bushels, and if he were to get that product, and if, moreover, each of the other four were to get the same, obviously the wages of the five men would take the total product. But, on the other hand, if the fifth man were thought to be worth only as much as he could add to the product of the other four, or if any one of the five were thought to be worth only as much as five men could produce over and above what four could produce, then each man would get only 100 bushels, leaving 1,000 bushels to the owner of the farm. This is the real marginal theory of distribution.

Another curious objection to the marginal theory is found in Professor Davenport's review of my recent book on *The Distribution of Wealth*.[1] He says:

The factors A, B, and C, which separately will produce 40, 30, and 20 respectively, will, in co-operation, produce more than the sum of 40, 30, and 20; it is because of this that they are put together; together they have, say, a product of 100. Remove A, and the product falls to 50; A appears therefore, by this subtraction method, to produce 50. But remove B and the product falls to 60, imputing, under the assumed rule, 40 to B. Remove C and the product falls to 70, C thus appearing to account for 30 of product. But 50, 40, and 30 are more than the whole joint product; the method will not work.

It is wrong in principle. A simple illustration of it is found in the case of the pair of gloves worth, say, one dollar. By this subtraction method either glove has imputed to it the value of the pair, and the pair thereby becomes worth, not one dollar, but two.

As to the pair of gloves, the illustration ignores one point which

[1] Cf. this *Journal* for December, 1904, pp. 138-44.

was insisted upon in that book, viz., that the marginal theory applies to specific units *such as are bought and sold.* Now, gloves are bought and sold in pairs, and the pair is the specific unit to which alone the marginal theory applies. This theory can obviously not apply to the separate legs of a pair of trousers, for the pair would be useless without either leg. But fortunately one is not forced to buy one's gloves or one's trousers in that way. If Professor Davenport knows of any community where such is the custom, he has a golden opportunity for original work in describing the economics of that community.

As to the factors A, B, and C, professor Davenport does not make clear whether they are different units of the same factor or separate factors altogether, such as land, labor, and capital. If they are different units of the same factor, the case he has assumed is one of increasing returns. Where all the other factors in the establishment remain the same, but the factor of which these are the units is variable, the product varies more than in proportion to the variation in this factor. This, I frankly confess, as I tried to make clear in the work under discussion, is a condition to which the marginal theory cannot be made to apply. But one can take comfort in the fact that it is also a condition which never exists in the real world, except in a few abnormal cases where the manager of the enterprise is making such a palpable mistake as must soon eliminate him and his establishment from consideration.[2]

But if, as seems the more reasonable interpretation, A, B, and C are separate factors, such as land, labor, and capital, he is again violating one of the rules of the marginal theory, for he is withdrawing one whole factor bodily, instead of a marginal unit of it. From this point of view, his illustration is not strong enough, for it is quite possible that the three factors could produce absolutely nothing separately, or even in twos. Then if any one were withdrawn, the whole product would disappear. This is just what would happen if A represented land, B labor, and C capital. But let us suppose that A, B, and C represent three different laborers working on a given amount of land and capital. They may still be different types of laborers performing different kinds of labor. In this case they are to be regarded as different factors, instead of as different units of the same factor. This case would differ only in degree from the one in which the three factors were land, labor, and capital, instead of the

[2] Cf. my *Distribution of Wealth,* pp. 76–84.

three kinds of labor; and the same objection would hold in the one case as in the other. It was to provide for just such cases that the considerable elaboration of the law of diminishing returns was undertaken in the work which Professor Davenport had under review.[3]

It seems necessary to call attention again to the fact that the marginal theory of value and distribution is a theory of equilibrium. At a certain stage in mental development it seemed that the world must necessarily rest on something. According to one traditional theory, the world rested upon a rock, and this rock upon another one, and so on. It was "rock all the way down." Another interesting theory was that the world rested on the back of a turtle. The turtle was a logical necessity to people who were not able to conceive of an equilibrium of forces. Economic theory is just beginning to emerge from the turtle stage, and many theorists still insist that value must rest on something — say, cost of production. That the value of an article may be the result of an equilibrium of forces, utility on the one side and cost on the other, neither of which can be said to "determine" value, is to some minds a mystery. Such minds are equally unable to comprehend the reasoning by which it is shown, for example, that the wages of labor are determined by an equilibrium of forces — the productivity of labor, on the one hand, creating the demand for it, and the standard of living of laborers, on the other hand, restricting the supply of it. To their way of thinking, the turtle is a necessity. Wages must rest either upon the standard of living or upon the productivity of labor, or something else equally definite. This is apparently the frame of mind of at least one reviewer of my *Distribution of Wealth,*[4] who argues that the marginal productivity theory does not correspond to anything in the real world, but that the refusal of laborers to work for anything less than the prevailing standard is the real determining factor in the wage problem.

I would not do Professor Davenport the injustice of even suspecting him capable of such a crude misinterpretation as this, but it seems that he is not altogether free from the turtle theory in his attempt to convict me of circular reasoning. The following is his argument:

As it seems to this writer, the relation between values and distributive shares is traced out by Professor Carver as follows:

The value of the agent is determined by the value of the product. But what

---

[3] Cf. pp. 85, 86.   [4] Boston *Transcript,* December 14, 1904.

determines the value of the product? The relative want. And what determines the relative want? The relative supply. And what determines the relative supply? The cost of production. And what determines the cost of production? The value of the agents employed. And what determines the value of the agents? The value of the product; etc., etc.

Now, if this is circular reasoning, it is a kind of circular reasoning to which every theory of equilibrium can be reduced. That there may be a group of factors which mutually help to determine one another is familiar to every student of science. To say that A determines B, that B determines C, and that C determines A, would be a piece of circular reasoning. But to say that A is *one* of the factors which determines B, that B is *one* of the factors which determines C, and that C is *one* of the factors which determines A, lacks a good deal of reasoning in a circle. This may be clearly seen if we assume that A, B, and C are three poles standing on end, leaning together (wigwam fashion) and mutually supporting one another. Remove any one and the others will fall. Each one *helps* to support each of the others; though there are other basic factors besides.

If anyone will attempt to follow me step by step around the circular pathway which Professor Davenport accuses me of having traveled, he will find that it is not a circle after all. As to the third step, for example, I nowhere assert that the relative want is determined by the relative supply, but that the relative supply is *one* of the factors in determining the relative want, which is merely the well-known marginal-utility theory. Similarly in the fourth step, I do not assert that cost of producton is the sole factor in determining the relative supply, but only that it is generally one factor, frequently a very important factor. Again, as to the fifth step, that the value of a factor of production for other purposes may sometimes be regarded as one item in the cost of production of a specific product, I took occasion to point out; but that this commits me to the proposition that the value of the factor alone determines the cost of the product, I should not admit for a moment.

These considerations, it seems to me, will destroy the force of Professor Davenport's main criticism. To attempt to reconstruct my argument in positive form is no part of the purpose of the present paper. I may say, however, that Professor Davenport's further contention that I have separated the problem of distribution from that of value is utterly beyond my comprehension. I hoped that whatever else the book had left undone, it had succeeded in demonstrating that these problems were one and the same.

But let us return to Mr. Hobson. In the article already cited he argues as follows:

Taking a farmer with a given quantity of organizing power, a fixed piece of land, and a fixed stock of farming capital, it looks as if we might learn something from the productivity of the tenth or marginal shepherd whom he just finds it worth while to employ. But what do the terms of this experiment imply? The only way of isolating the productivity of the marginal shepherd is to suppose that the farmer used his land, capital, and organized power with nine instead of ten shepherds; that is, to suppose him to be an "uneconomic" man, wasting some of the powers in his other factors of production. If it is better for him to employ the tenth shepherd, it is because by employing him he will make a slightly better use of the other given factors; and here, *ex hypothesi,* it is not possible to discriminate how much of what is added to the total product can rightly be attributed to the specific productivity of the tenth shepherd, and how much to the better functioning of the other factors. . . . .

If we assume that a farmer has been employing nine shepherds where he ought to have been employing ten, and we let him add a tenth, and ascribe the increased product which covers an improved use of all the factors of production to this last unit of labor, we are arguing in a quite unwarrantable way. Our real farmer, as an entrepreneur, capable of borrowing units of capital and of renting or buying land as well as of hiring labor, at given prices, must be conceived to put the following question to himself as he plans the most profitable use of his skill and experience: "How many shepherds shall I employ to how many acres of land, and how many £100 worth of farm capital of various concrete kinds?" He will not consider doses of labor except in organic relation to doses of land and capital. His real doses will be composite doses of farming-power, composed in varying proportions of the several factors, and no dose will be considered to have a separate productive value apart from the others with which it will co-operate, so as to give a fuller utilization of the productive powers of the whole farm under his management. . . . .

If a truly economical farmer takes on more labor, he will either require more capital or more land, or else will be changing his whole method of production to meet some change in the market. Even if he takes on no more land or capital, the reorganization of his labor-force accompanying the increase of employment will preclude him from attributing to the new labor the entire value of the increased product, or any assignable portion as its exclusive or specific yield. . . . .

Turn to any ordinary modern industry, and it becomes at once apparent that the problem is one of an organic amalgam of productive powers which does not permit the attribution of a separate productivity either to the separate factors or to a marginal unit of composite productive power.

Now, this indicates that Mr. Hobson regards a farm as an "organic amalgam" in which the various ingredients must be combined in a definite proportion in order to produce the largest results. One cannot help wondering where his farming experience was acquired. The fact is that there is no fixed proportion in which the factors land, labor, and capital have to be combined, independently of the price of each and that of the product. There are several ways of growing a thousand pounds of wool. One is to use much land with little labor, and another is to use little land with much labor. Which is the more economical will depend upon the relative cheapness of land and labor. If labor costs the farmer in Mr. Hobson's illustration a dollar and a quarter a day, his interests as an "economic man" might require him to employ only nine men; but if he can get his men for a dollar a day, it might be more economical for him to hire ten men. In either case the problem would be: Will ten men produce enough more than nine men to pay the tenth man's wages?

There is probably no farm now employing nine men upon which ten men would not produce more than the nine are producing, and it would be a rare farm indeed where the addition of this tenth man would add one-ninth to the existing product. Whatever the tenth man adds would represent his value to the farmer. There may be objections to calling this amount the "specific product" of the tenth man — that is a matter of words; but there can be no objection to saying that this amount is the maximum amount which the farmer, as an "economic man," can afford to pay for the labor of the tenth man.

After all is said, it becomes increasingly evident that the next stage in the development of economic theory must be concerned with the theory of production. One vital part of this new theory of production must be a closer analysis of the law of diminishing returns and its derivative, the law of marginal productivity. In the opinion of the present writer, if Mr. Hobson had made this analysis, he would have written a different article from the one under consideration.

T. N. CARVER.

HARVARD UNIVERSITY.